

Patent Claims

1. Safety belt retractor (10), especially for use in motor vehicles, having a blocking system that is controlled in a vehicle sensitive and/or belt strap sensitive manner, and with a tensioning device, which acts on the belt shaft (12), for carrying out a reversible pretensioning of the occupant, whereby the belt shaft (12) can be coupled with an electric motor (16), as a tensioner drive, via an interposed gear mechanism, characterized in that as the gear mechanism for the connection of the belt shaft (12) to the electric motor (16), a worm or spiral toothing is provided that meshes with an external toothing (20) of the belt shaft (12), whereby the spiral toothing (19) is supported against a fixed counter-bearing (23) in such a way that upon the occurrence of an axial loading of the spiral toothing (19) directed against the counter-bearing (23) due to a load acting upon the belt shaft (12) in the belt withdrawal direction (arrow 40), a rotation of the spiral, for receiving the torque applied by the belt shaft (12), is prevented via a support force.
2. Safety belt retractor according to claim 1, characterized in that the spiral toothing (19) is coupled to a drive shaft (34) of the electric motor (16) via a miter-wheel gearing (17).
3. Safety belt retractor according to claim 2, characterized in that the miter-wheel gearing is embodied as a crown wheel gear

mechanism (17).

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4. Safety belt retractor according to one of the claims 1 to 3, characterized in that the spiral toothing (19) is formed on a carrier shaft (18), and the carrier shaft (18) is connected to the miter-wheel gearing.
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5. Safety belt retractor according to one of the claims 1 to 4, characterized in that a friction-increasing component (25, 26, 28, 30) is disposed between the counter-bearing (23) and the first thread of the spiral toothing (19).
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6. Safety belt retractor according to claim 5, characterized in that a spacer disk (25) of a material having a non-linear coefficient of friction is provided.
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7. Safety belt retractor according to claim 5, characterized in that a bearing disk (26) is provided that deforms axially and elastically as the load increases.
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8. Safety belt retractor according to claim 5, characterized in that the surface of the counter-bearing (23) that faces the spiral toothing (19) is provided with a conical recess, and disposed on the carrier shaft (18) is a conical friction body (28) that has a corresponding shape and is made of an elastic material.

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9. Safety belt retractor according to claim 5, characterized in that a compression spring (30) is disposed between counter-bearing (23) and spiral toothing (19), and carrier shaft (18) and counter-bearing (23) are provided with latching structures (31) that interengage during axial displacement of the carrier shaft (18).
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10. Safety belt retractor according to claim 1, characterized in that the end face of the carrier shaft (18) is supported against a shank (33) of the drive shaft (34) of the electric motor (16).
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11. Safety belt retractor according to claim 1, characterized in that the crown wheel toothing of the crown wheel gear mechanism (17), which is effective between drive shaft (34) of the electric motor (16) and carrier shaft (18), has a multi-stage configuration such that during axial loading of the carrier shaft (18), the transmission of the crown wheel gear mechanism (17) changes.
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12. Safety belt retractor according to one of the claims 1 to 11, characterized in that the electric motor (16) is designed with a further performance range for applying a holding moment that aids in the prevention of the rotation of the spiral toothing (19).
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13. Safety belt retractor according to claim 12, characterized in that the holding moment of the electric motor (16) can be adjusted by the motor control as a function of the load that acts on the belt shaft (12) in the belt withdrawal direction.

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14. Safety belt retractor according to one of the claims 1 to 13, characterized in that the carrier shaft (18), which carries the spiral toothing (19), at its end that is opposite the miter-wheel gearing, is held in a bearing (21), and in the region between the spiral toothing (19) and the miter-wheel gearing (17) is mounted in an additional thrust bearing (22) that is surrounded by a bearing housing (23).
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15. Safety belt retractor according to claim 14, characterized in that the thrust bearing is embodied as a cup-shaped bearing (22).
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16. Safety belt retractor according to claim 14 or 15, characterized in that the bearing housing (23) forms the counter-bearing for the spiral toothing (19).